

WHAT IS CLAIMED IS:

1. A hybrid material comprising:  
a ceramic with void space; and  
a metal;  
wherein the metal is covalently bonded to the ceramic.
2. The material of Claim 1, wherein the ceramic comprises silica.
3. The hybrid material of Claim 2, wherein the ceramic comprises 100% silica.
4. The hybrid material of Claim 3, wherein the ceramic comprises up to 50% cristobalite.
5. The hybrid material of Claim 1, wherein the ceramic material comprises up to 60% alumina.
6. The hybrid material of Claim 2, wherein the metal is selected from the group consisting of: Mg, Ca, Sc, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Pd, Ag, Cd, Pt, Au, any ionic forms thereof, and any combinations thereof.
7. The hybrid material of Claim 1, wherein the metal is an alloy.
8. The hybrid material of Claim 1, wherein at least 50% of the void space is occupied by the metal.
9. The hybrid material of Claim 1, wherein at least 80% of the void space is occupied by the metal.
10. The hybrid material of Claim 1, wherein at least 95% of the void space is occupied by the metal.

11. The hybrid material of Claim 1, wherein the metal comprises at least 50% of the hybrid material by weight.

12. The material of Claim 1, wherein at least 98% of the void space is filled with the metal.

13. The hybrid material of Claim 1, wherein the metal comprises at least 50% of the hybrid material by volume.

14. A method of making a hybrid material comprising:

providing a ceramic with void space;  
introducing metal particles into the void space of the ceramic; and  
heating the metal particles;  
wherein the ceramic is covalently bonded to the metal after the heating step.

15. The method of Claim 14, wherein the metal particles are heated by supplying an electric current to the metal particles.

16. The method of Claim 14, wherein the ceramic comprises 100% silica

17. The method of Claim 14, wherein the ceramic comprises up to 50% cristobalite.

18. The method of Claim 14, wherein the ceramic comprises up to 60% alumina.

19. The method of Claim 14, wherein the ceramic includes exposed surfaces comprising at least 50% silicon dioxide prior to introducing the metal particles.

20. The method of Claim 14, wherein the ceramic includes exposed surfaces comprising titanium dioxide or platinum oxide prior to introducing the metal particles.

21. The method of Claim 14, wherein the metal particles are selected from the group consisting of: Mg, Ca, Sc, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Pd, Ag, Cd, Pt, Au, any ionic forms thereof, and any combinations thereof.

22. The method of Claim 14, wherein the metal particles comprise an alloy.

23. The method of Claim 14, wherein the metal particles are microparticles.

24. The method of Claim 14, wherein the metal particles are nanoparticles.

25. The method of Claim 14, wherein the ceramic has an average pore size and the metal particles have an average diameter and wherein the average diameter of the metal particles is less than the average pore size of the ceramic.

26. The method of Claim 24, wherein the average diameter of the metal particles is no greater than two thirds the average pore size of the ceramic.

27. The method of Claim 14, wherein introducing metal particles into the void space further comprises introducing a suspension of metal particles into the ceramic.

28. The method of Claim 27, wherein the suspension of metal particles comprises alcohol, water or a combination thereof.

29. The method of Claim 14, wherein heating the metal particles further comprises application of an electric current.

30. The method of Claim 14, wherein heating the metal particles further comprises convection heating.

31. The method of Claim 14, wherein the at least 50% of the void space is occupied by the metal.

32. The method of Claim 14, wherein at least 80% of the void space is occupied by the metal.

33. The method of Claim 14, wherein at least 95% of the void space is occupied by the metal.

34. The method of Claim 14, wherein at least 98% of the void space is occupied by the metal.

35. The method of Claim 14, wherein the metal comprises at least 50% of the hybrid material by weight.

36. The method of Claim 14, wherein the metal comprises at least 50% of the hybrid material by volume.